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Energy Conservation Techniques are an Effective form of Treatment for Patients with Multiple Sclerosis

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CLINICAL SCENARIO:

Many patients with multiple sclerosis experience a great deal of fatigue that affects their participation in daily activities, as well as occupational performance. By reducing fatigue for these individuals, they may be able to engage in more occupations in which they would like to participate, which could lead to an improved quality of life.

Energy conservation techniques are widely used in occupational therapy practice for patients who are experiencing fatigue. Assessing whether or not the use of these techniques is an effective form of treatment for persons with multiple sclerosis is crucial in order to continue the use of these techniques in practice.

Focused Clinical Question:

What are the effects of energy conservation techniques on fatigue for patients with a diagnosis of multiple sclerosis?

SUMMARY of Search, 'Best' Evidence' appraised, and Key Findings:

- Five studies met the inclusion/exclusion criteria.
- The RCT conducted by Mathiowetz, et al., was determined to be the best evidence and was critically appraised.
- The study reports a significant decrease in fatigue impact as a result of energy conservation techniques.

CLINICAL BOTTOM LINE:

The use of energy conservation techniques in occupational therapy practice leads to a decrease in fatigue impact for persons with multiple sclerosis. A randomized controlled trial (Mathiowetz, et al., 2005) reports that the efficacy and effectiveness of an energy conservation course decreases fatigue impact, and increases self-efficacy and some aspects of quality of life. An energy conservation course "taught by occupational therapists is a legitimate non-pharmacological approach for managing fatigue for persons with multiple sclerosis." (p. 600)

Limitation of this CAT: This critically appraised paper has not been peer-reviewed by an independent person. It does not claim to be a full and exhaustive search of available literature.

SEARCH STRATEGY:

Terms used to guide Search Strategy:

- **P**atient/Client Group: patients with multiple sclerosis
- **I**ntervention (or Assessment): energy conservation techniques
- **C**omparison: not applicable
- **O**utcome(s): effect on fatigue

Databases and sites searched	Search Terms	Limits used
Medline Cinahl PsychInfo Ovid	• Multiple sclerosis • Energy conservation • Effectiveness • Fatigue • Energy conservation education • Energy conservation techniques	No limits used

INCLUSION and EXCLUSION CRITERIA

- Inclusion:
  - Must be written in English
  - Must include energy conservation (EC)
  - Must explore patients with multiple sclerosis
  - Must explore the effects of EC treatment on fatigue
  - Must pertain to occupational therapy practice/intervention
  - Must be more recent than the year 2000.

- Exclusion:
  - Articles not written in English
  - Articles that explored alternative forms of treatment rather than energy conservation techniques
  - Articles that explored other neurological disorders besides multiple sclerosis
  - Studies that did not explore effects of energy conservation on fatigue
  - Studies that did not pertain to occupational therapy practice/intervention
  - Studies that were not more recent than the year 2000.

RESULTS OF SEARCH

Table 1: Summary of Study Designs of Articles retrieved

Study Design/ Methodology of Articles Retrieved	Level	Number Located	Author (Year)
Before-After Design	**1**	**2**	• Sauter, Zebenholzer, Hisakawa, Zeithofer, & Vass (2008) • Mathiowetz, Matuska, & Murphy (2001)
Randomized Controlled Trial	**1**	**2**	• Matuska, Mathiowetz, & Finlayson (2007) • Mathiowetz, Finlayson, Matuska, Chen, & Luo (2005)
Grounded Theory (Qualitative)	**N/A**	**1**	• Holberg & Finlayson (2007)

BEST EVIDENCE

The following study/paper was identified as the 'best' evidence and selected for critical appraisal. Reasons for selecting this study were:

- The study met the inclusion/exclusion criteria.
- The article focused on an occupational therapy intervention.
- The findings are applicable to occupational therapy practice.
- The study is a randomized controlled trial, which demonstrates quality evidence.
- The study addressed the focused clinical question.

SUMMARY OF BEST EVIDENCE

Table 2: Description and appraisal of the *Randomized controlled trial of an energy conservation course for persons with multiple sclerosis*, by Mathiowetz, Finlayson, Matuska, Chen, & Luo, 2005.

Objective of the Study:

The specific objective of this study was to explore the effectiveness of an energy conservation course and its impact on fatigue, quality of life, and self-efficacy for individuals with multiple sclerosis.

The study reports that fatigue occurs within 75-90% of all patients with multiple sclerosis. Fatigue has been known "to prevent sustained physical functioning and to exacerbate other MS symptoms," (p. 592) and is sometimes the most frustrating part of experiencing a diagnosis of MS. In order to manage fatigue, many individuals

utilize energy conservation techniques. However, this study states that there was no scientific evidence for the efficacy of energy conservation education, yet these techniques were widely used in practice. Therefore, the researchers state that it was crucial for the efficacy and effectiveness of energy conservation education to be explored in order to determine if it is an effective form of treatment to utilize in occupational therapy practice.

Study Design:

A crossover design was utilized in this study. This study consisted of two groups; an immediate intervention group and a delayed control group. The immediate intervention group was enrolled in a six-week energy conservation course one week after the initial screening session occurred. The six-week course was followed by a no-intervention period that lasted six weeks as well. The delayed control group had a control period of six weeks prior to being enrolled in the energy conservation course. They began the course on week 8 of the study. Primary dependent variables of fatigue impact and quality of life were assessed three times during the study; week 1, 7 and 13. Follow-up data will be reported in an additional article one year after the study was complete.

Setting:

The study occurred in a community setting. This consisted of locations such as MS chapter offices, churches and public libraries.

Participants:

A list of possible participants was acquired via the Minnesota and Illinois Chapters of the National MS Society. Mailings were sent out to each of these individuals, who then contacted the project directors if interested. Once interested persons contacted the directors, a two-part screening process was conducted. The first part of the screening involved an interview via telephone with the program director to discuss inclusion criteria. Inclusion criteria is as follows: “person had a diagnosis of MS, was 18 years of age or older, reported being functionally literate in English (i.e., able to read course materials), had a Fatigue Severity Scale (FSS) score of 4 or greater, lived independently in the community, and agreed to attend at least five out of six energy conservation sessions. People who met all of the inclusion criteria were asked to attend an in-person screening session.” (p. 593)

The second part of the screening process consisted of an in-person screening, which primarily focused on assessing cognitive abilities. The Neuropsychological Screening Battery for Multiple Sclerosis was administered to each of the individuals in order to explore sustained attention, concentration, verbal learning, visuospatial learning, and semantic retrieval. Potential participants were excluded if more than one subtest was failed. Individuals who were excluded from the study received an information packet on fatigue management. No significant differences were discovered between the two groups during statistical analysis.

Intervention Investigated:

An energy conservation course developed by Packer and associates was utilized as the primary intervention in this study. This is a 6-week community-based course for adults experiencing fatigue secondary to chronic illnesses. This consists of 6 weekly classes that are very structured and described in detail in a manual developed by Packer, et al. Each course is two hours long and consisted of "lectures, discussions, long-term and short-term goal setting, activity stations, and homework activities to assist participants' integration of energy conservation principles with their performance of everyday tasks. The 6 sessions addressed the importance of rest throughout the day, positive and effective communication, proper body mechanics, ergonomic principles, modification of the environment, priority setting, activity analysis and modification, and a balanced lifestyle" (p. 594). The participants were required to attend at least 5 out of 6 of the EC courses that were provided.

Outcome Measures:

The outcome areas explored in the study are fatigue and health-related quality of life. For these outcome areas, the study utilized the Fatigue Impact Scale, SF-36 health survey, Self-efficacy for performing EC strategies assessment as outcome measures. The FIS and SF-36 health survey are primary measures, whereas the Self-efficacy for Performing EC Strategies Assessment is a secondary outcome measure.

The Fatigue Impact Scale explores 40 statements that pertain to physical, cognitive, and psychosocial measures of fatigue. The scale is a Likert scale rated on a scale of 1 to 5 (1 meaning "no problem" versus 5 meaning "extreme problem"). The maximum score is 800, whereas the minimum score is 40. The measure is administered by the occupational therapists who conduct the courses throughout the study in the community settings in which the study is conducted. Reliability and validity is supported for this scale.

The SF-36 health survey explores the notion of quality of life. As this is not the primary concern of this CAT, this information is irrelevant.

The FIS and SF-36 Health Survey assessments were filled out at week 1. The Self-Efficacy for Performing EC Strategies Assessment was administered before and after the EC course for both groups. Follow-up was also measured for participants who completed all of the courses.

Main Findings:
(p. 597)

Dependent variables	ITT Likelihood (n=169)		ITT LOCF (n=169)		Compliers (n=131)	
3 FIS subscales	Difference (95% CI)	P-value	Difference (95% CI)	P-value	Difference (95% CI)	P-value
FIS: Cognitive	-2.55 (-4.88, -0.21)	0.0092	-1.98 (-3.98, 0.02)	0.0178	-2.17 (-4.68, 0.33)	0.0370
FIS: Physical	-3.71 (-6.06, -1.37)	0.0002	-2.89 (-4.94, -0.84)	0.0008	-3.91 (-6.52, -1.31)	0.0004
FIS: Social	-6.10 (-10.24, -1.95)	0.0005	-4.74 (-8.32, -1.16)	0.0016	-5.64 (-10.13, -1.15)	0.0028

Effect size for the Fatigue Impact Scale (p. 598)

Dependent variables	ITT Likelihood (n=169) Effect size	ITT LOCF (n=169) Effect size	Compliers (n=131) Effect size
3 FIS subscales			
FIS: Cognitive	0.57	0.52	0.52
FIS: Physical	0.83	0.74	0.90
FIS: Social	0.77	0.69	0.75

Original Authors' Conclusions

"This randomized controlled trial supports the efficacy and effectiveness of the EC course to decrease fatigue impact, and to increase self-efficacy and some aspects of quality of life. Thus, this EC course taught by occupational therapists is a legitimate non-pharmacological approach for managing fatigue for persons with MS" (p. 600).

Critical Appraisal:

Validity

- Written and informed consent were obtained prior to beginning the study.
- Inclusion and exclusion criteria were stated.
- The two-part screening process was reported in detail.
- Participants were obtained via a volunteer basis, which could result in a volunteer or referral bias. This could have influenced the results of the study in favor of the hypothesis as people who volunteer or who are referred are generally more inclined to cooperate.
- Attention bias could have occurred as the participants may have rated in favor of the study as the primary reasoning for the study was evident throughout the energy conservation course.
- The sample was randomly assigned to either the intervention group or the delayed cohort group. However, it was not discussed as to whether or not this process was blind.
- There was a high attrition rate in the study (23%), which could have affected the results in either a positive or negative manner.
- Each of the participants were motivated to participate in the study as they all reported a medium to severe effect of fatigue in their daily lives. This could have skewed the results as the participants may have reported information in a more positive manner.
- The results of this study are not generalizable to all methods of education as this study was conducted in a group setting.
- This study scored 7 out of 10 on the PEDro Scale. Internal validity score: 5/8. External validity score: 2/2. Total score: 7/10.

Interpretation of Results

- The study reported that the intervention group was significantly different from the control group ($p<0.05$).

- For all three subscales of the Fatigue Impact Scale, the analyses were significant ($p<0.05$). In these analyses, the control group was significantly different than the intervention group.
- Large effect sizes were reported for the physical subscale of the FIS (>0.8), whereas large to moderate effect sizes were reported for the cognitive and social subscales (0.5-0.79).
- There was a 95% confidence interval level reported for all of the results.
- There were no significant differences reported when participants increased/decreased or changed their medications between Week 7 or Week 13. 74% of the participants reported that they did not change their medications throughout the course of the study.

Summary/Conclusion:

If energy conservation strategies are utilized throughout occupational therapy practice, it may improve the effects on fatigue for clients with a diagnosis of multiple sclerosis. Incorporating energy conservation techniques into practice is a promising form of treatment that may improve occupational performance for patients with MS as they may experience a smaller impact in their daily lives from fatigue. Therefore, it may be a benefit to occupational therapy practice if therapists educate patients with a diagnosis of multiple sclerosis on how to utilize energy conservation techniques, in order to improve their occupational performance in their daily lives.

Table 3: Characteristics of included studies

	Study 1 (Sauter, et al., 2008)	Study 2 (Matuska, et al., 2007)	Study 3 (Mathiowetz, et al., 2001)	Study 4 (Holberg, et al., 2007)
Intervention investigated	An energy conservation course developed by Packer, et al., was provided for 32 subjects who met the inclusion/exclusion criteria. The 32 subjects were split into four groups; two intervention groups and two control groups. The intervention groups received the energy conservation course for the first six weeks of the study, whereas the control groups received no treatment. The intervention group followed the six-week course with no treatment, while the control groups took the energy conservation course.	This study is a follow-up six weeks after the initial study in order to explore perceived effectiveness of an energy conservation course. A 6-week, community-based energy conservation course for adults experiencing fatigue secondary to chronic illnesses that was developed by Packer and associates (1995) was utilized. Each course consists of 6 weekly, 2-hour, very structured classes as described in detail by Packer, et al. Groups were taught by certified occupational therapists in community settings.	The energy conservation course developed by Packer, et al., was utilized as the primary intervention. This course was taught by 4 occupational therapists who were all trained how to teach the Packer, et al., energy conservation course. After the 6-week courses were completed, there was a no intervention period that lasted 6 weeks. This was used to determine if its benefits were maintained over that time period.	In this study, a qualitative, grounded theory approach was utilized. Semi-structured, open-ended interviews were used to record participants' thoughts, feelings, and actions resulting from participation within an energy conservation course. In addition, participants engaged in a card-sort activity to promote discussion about past, present, and future use of the 14 energy conservation strategies addressed in managing fatigue. Elements of the study were documented via tape-recording and questionnaires. At the end of the interview, the "first author" wrote a two-page summary about each interview and shared it with the participant for member-checking.
Comparison intervention	The delayed-control group did not receive the intervention while the intervention group participated in the energy	The control intervention did not receive treatment during the first six weeks of the study while the intervention	The control intervention consisted of a weekly 2-hour support group for 6 weeks. These support groups	N/A

	conservation course. Once the intervention group completed the intervention, the delayed-control group began the energy conservation course.	group took the energy conservation course. Once the intervention group completed the course, the control group took the course.	involved education on and discussion of topics that are commonly addressed in support groups for people with MS. The topics included basic information on MS, basic medications, financial issues, estate planning, the Americans with Disabilities Act, reasonable accommodation, dealing with others expectations, nutrition, exercise, memory problems, hiring an aide, and community resources. When fatigue management was mentioned, the participants were told that these topics would be addressed during the following 6-week course. The support group was led by an occupational therapist, who also led the energy conservation education. Following the support group, the control group received the energy conservation course.	
Outcomes used	Fatigue, sleep quality, and depression were all explored. However, fatigue is the primary outcome area that is under investigation in this CAT. The outcome measures	The Energy Conservation Strategies Survey was implemented in order to explore energy conservation strategy use 6 weeks following the initial study. The measure was reported to be reliable. Validity was not	The primary measures that were utilized were the Fatigue Impact Scale, the Self-Efficacy Gauge, and the Medical Outcomes Study Short-Form Health Survey. These measures were used to explore fatigue, self-	The Stage of Change Questionnaire was administered to each participant at each interview. An interview was also conducted throughout the meeting that addressed strategies participants used

	utilized to explore fatigue are as follows: Fatigue Severity Scale, MS-specific Fatigue Scale, Modified Fatigue Impact Scale, and a diary reporting daily fatigue levels (10-graded scale for the entire 12-week study period). The outcome measures utilized were tested as reliable and valid. Outcomes were collected at baseline, termination, and at follow-up 7-9 months after the courses were complete.	addressed.	efficacy, and quality of life. These variables were assessed in a pre-test, post-test, and a follow-up 6 weeks after the study was complete.	before taking the energy conservation course, strategies they had used since the course ended, strategies they were using at the time of the interview, and strategies that they expected to use in the future. A card sort activity was utilized. Throughout this activity, questions were asked by the researcher to gather in-depth information about the participants' particular choices. A background questionnaire was administered at the end of the interview to obtain demographic information such as age, gender, education and ethnicity. The interview was also recorded via a tape-recorder.
Findings	The mean scores in the Fatigue Severity Scale and in the MS-specific Fatigue Scale did not improve significantly at termination and follow-up. The data from daily fatigue diary scores showed a decrease in scores after participation in the course in all four groups, but the results	The strategies implemented by more than 70% of the participants included the following: changed body position for certain activities, planned the day to balance rest and work, modified the frequency or outcomes standards of activities, included rest periods in the	Results indicate that there was a significant effect of time for the Fatigue Impact Scale total scores, and that there was less fatigue impact after the energy conservation course. There was a medium to large effect size. There was also no change in fatigue due to the support group	A striking finding from this study was the way participation in the course not only helped participants to better manage their multiple sclerosis fatigue but also had a ripple effect in their lives. Several participants found that the use of energy conservation strategies

	were not significant. The study concluded that fatigue may never be completely eliminated due to the program that was implemented, but that it could be improved in order to regain "self-control through modification of daily activities, incorporating rest and restarting activities, which were given up due to fatigue."	day for at least 1 hour, adjusted priorities, simplified activities, communicated need for assistance, and rested during longer activities. Of those who reported not using these strategies, the primary reason was because they were already doing it before the course. The strategies implemented the least were as follows: changed the time of day of an activity and started using adaptive equipment or devices. Of the participants who reported not using the strategies, the primary reason was because they were already doing it before the course. Additionally, 13% who did not use adapted equipment reported that they were unsure about what equipment to use or were unable to use it. All of the energy conservation strategies were rated as effective (range of 7.0-8.2 on a rating scale of 1-10 with 10 being most effective). The energy conservation strategies rated as most effective (7.5 or higher) were	sessions. The results show that the effects of the energy conservation course were maintained in the 6 weeks after the course. The Self-Efficacy Gauge supported the notion that there was no change in fatigue because of the support group sessions. They also indicated that there was no change in quality of life during the support group and the no-intervention time periods.	decreased stress, aided cognitive functioning, and improved psychological well-being. This study not only supports the use of energy conservation strategies to manage multiple sclerosis fatigue, but also suggests that energy conservation strategies can be a supplement in managing other multiple sclerosis symptoms.

		delegated tasks to other people, planned the day to include a balance of rest and work, and rested during longer activities.		

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

Energy conservation courses have shown to assist in managing the impact of fatigue. Therefore, occupational therapy should incorporate energy conservation courses and techniques into practice and interventions in order to assist patients with multiple sclerosis manage the effects of fatigue.

Sauter, et al., state that fatigue may never be completely eliminated due to the energy conservation program that was implemented, but that it could be improved in order to regain "self-control through modification of daily activities, incorporating rest and restarting activities, which were given up due to fatigue" (2008, p. 504). This study indicates that activities may be modified throughout daily activities for clients in order for them to save energy throughout the progression of the day. Occupational therapy is experienced in adapting and modifying techniques and activities, and is therefore qualified to treat fatigue (Matuska, et al., 2007). Utilizing energy conservation techniques has shown to have beneficial effects for patients with MS and could be a useful technique to utilize in occupational therapy practice (Sauter, et al., 2008; Mathiowetz, et al., 2005; Matuska, et al., 2007; Mathiowetz, et al., 2001; Holberg & Finlayson, 2007).

Matuska, et al., (2007) state that occupational therapists traditionally teach energy conservation strategies to their clients who report fatigue, but often in a one-to-one situation. "The group format used in this study appeared to be a good venue for this type of education and may be a useful alternative delivery model" (p.67). Additionally, to be most effective, occupational therapists may need to expand their education of energy conservation strategies to their clients' families and employers (Matuska, et al., 2007; Mathiowetz, et al., 2005; Holberg & Finlayson, 2007).

There is much future research needed in order to determine if the energy conservation course developed by Packer, et al., would be effective in other settings or in other formats such as one-on-one education. These results of each study reviewed (Sauter, et al., 2008; Mathiowetz, et al., 2005; Matuska, et al., 2007; Mathiowetz, et al., 2001; Holberg & Finlayson, 2007) indicate that an energy conservation course is effective for groups of individuals with MS. Therefore, it may be reasonable to incorporate group education courses in OT practice, as well as to further explore the effectiveness of delivery methods (one-on-one, groups, 1 week condensed, etc.).

Holberg & Finlayson (2007) state that the wording and presentation of energy conservation strategies may influence persons with MS willingness to use them, which suggests that therapists need to be sensitive to the way information is presented during this type of education. Materials that empower clients may increase their willingness to use them. Peer interaction was valued by participants and suggests treatment or, at minimum, ensures that they are recommending activities such as support groups for their clients. Finally, comments from participants suggested that other people did not understand MS fatigue, and therefore, it might be beneficial to have energy conservation educational courses geared toward the caregivers or loved ones of people with MS. Energy conservation use is not dependent on a single factor, but rather is contextually dependent. Having a solid contextual understanding of the client is likely to enable occupational therapists to target educational efforts that will assist clients with MS to use energy conservation strategies that will benefit them within their own environments and situations (Holberg & Finlayson, 2007).

As occupational therapists, it is our responsibility to become aware of energy conservation techniques and further educate ourselves on techniques that may be usable for our clients with MS. We may continue to educate ourselves throughout practice by exploring and keeping up to date on current research, explore the National MS Society and recommendations, as well as interviewing and discussing techniques that are effective with clients who have MS. These strategies may not only be effective for MS, but may be effective for other patients with neurological disorders as well. Further research should be conducted in order to explore this notion.

REFERENCES

Critically appraised article:

Mathiowetz, V.G., Finlayson, M.L., Matuska, K.M., Chen, H.Y., & Luo, P. (2005). Randomized controlled trial of an energy conservation course for persons with multiple sclerosis. *Multiple Sclerosis, 11*, 592-601.

Other evidence:

Holberg, C. & Finlayson, M. (2007). Factors influencing the use of energy conservation strategies by persons with multiple sclerosis. *American Journal of Occupational Therapy, 61*, 96-107.

Mathiowetz, V., Matuska, K.M., Murphy, M.E. (2001). Efficacy of an energy conservation course for persons with multiple sclerosis. *Physical Medicine and Rehabilitation, 82*, 449-456.

Matuska, K., Mathiowetz, V., & Finlayson, M. (2007). Use and perceived effectiveness of energy conservation strategies for managing multiple sclerosis fatigue. *American Journal of Occupational Therapy, 61*, 62-69.

Sauter, C., Zebenholzer, K., Hisakawa, J., Zeithofer, J., & Vass, K. (2008). A longitudinal study on effects of a six-week course for energy conservation for multiple sclerosis patients. *Multiple Sclerosis, 14*, 500-505.